



Mixing & Placing Cement & Concrete Mixes

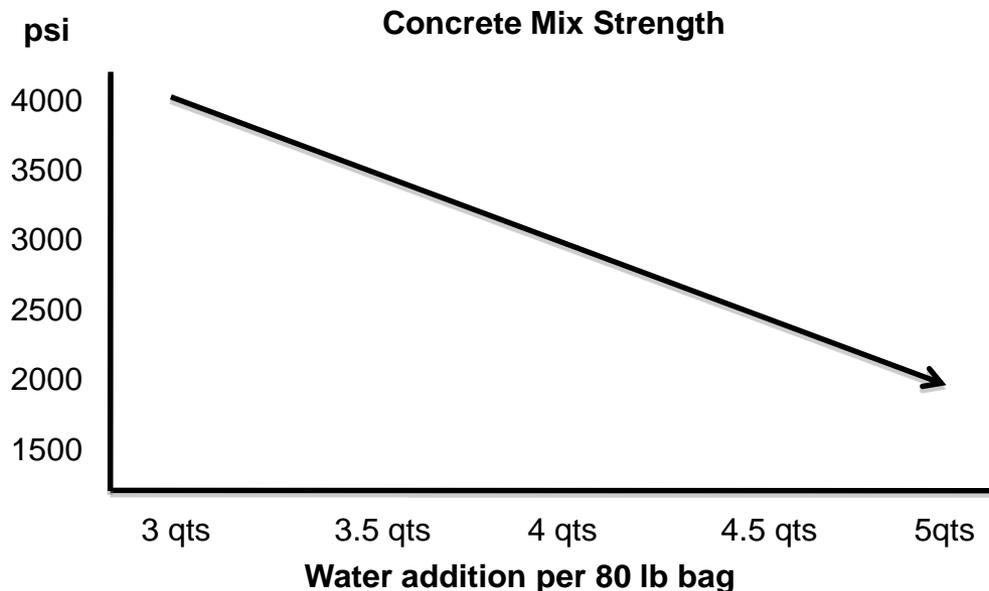
Mixing Concrete – Adding Water



When mixing concrete, it is important to know that **the more water that is added to the mix, the weaker the concrete becomes.** Concrete is designed to reach specific minimum compressive strengths, based on the water addition instructions listed on the bag.

Mixing Concrete – Adding Water (cont'd)

QUIKRETE® Concrete Mix, for example, will achieve an average compressive strength of 4000 psi (pounds per square inch) with the addition of 4 quarts of water per 80 lb bag. Adding 5 quarts of water will not only reduce the ultimate strength to just 2500 psi, it will also lead to increased shrinkage cracking.



Mixing Concrete - Proper Consistency



Properly mixed concrete should look like thick oatmeal and should hold its shape when it is squeezed in a gloved hand.

The term Slump is used to describe the fluidity of wet concrete. Slump is determined by placing concrete into a 12" tall "open-top" cone and then lifting the cone. The number of inches the concrete "slumps" down from the original height is considered the slump. Properly mixed concrete should be mixed to a 2"-3" slump.



Mixing Methods

QUIKRETE® concrete mixes can be successfully mixed by hand or machine mixed.



Hand mixing can be done in a mortar tub or wheelbarrow with a shovel or hoe.



When **machine mixing**, concrete should be mixed in a barrel-type mixer. The mixing blades in a barrel-type mixer are attached to the inside of the rotating barrel.

**Note: rubber gloves and safety glasses should always be used during concrete and mortar mixing and placing procedures.*



Click TV screen to play video.

When hand mixing concrete empty the mix into a mortar tub or wheelbarrow. Form a depression in the middle of the mix.

Measure the recommended water amount and pour approximately $\frac{2}{3}$ of the water into the depression.

Work the mix with a hoe, gradually adding water, until the mix reaches a uniform, workable consistency.

Machine Mixing Concrete

When machine mixing concrete, it is important to **add the water to the mixer before adding the dry mix**. Typical mixers can hold up to three bags of 80 lb concrete mix.

Measure the recommended water amount for the number of bags to be added to the mixer and **pour half of the water into the mixer**.





Click TV screen to play video

Turn the mixer on and add the dry mix into the mixer. Allow to mix for about a minute and then add the remaining water as necessary.

Mix for 3-5 minutes, until a uniform, workable consistency is achieved.

If additional water is needed add **small amounts** of water sparingly.

Do not re-temper (add extra water) after the concrete or mortar has begun to set. Re-tempering can cause excessive shrinkage and reduces the strength of the mix.

Adding Cement Colors



For a uniform mix, add liquid cement color to the mixing water, before mixing the concrete.

Adding liquid cement color to standard gray concrete mix can turn it into a decorative concrete with professional results.

Adding Cement Colors (cont'd)

- **One 10 oz. bottle of QUIKRETE® Liquid Cement Color will color up to two bags of 60 lb or 80 lb concrete mix.** It is important to blend the Liquid Cement Color into the mixing water before adding it to the mix.
- Using the same water-to-color ratio will help maintain color uniformity from batch to batch. If more water is needed in the mix, add it sparingly.
- After placing and finishing the concrete proper curing is necessary to produce a consistent color. Use a fine water mist to keep the concrete surface damp for a minimum of 3 days or apply QUIKRETE® Acrylic Concrete Cure & Seal immediately after finishing.

Integral color will last the life of the concrete.



Available in Charcoal, Red, Brown, Buff and Terra Cotta.

Calculating How Much Concrete You Need*



First you need to determine the volume of the slab you wish to pour.

This is done simply by **multiplying the length times the width times the height**. Generally concrete slabs are poured to a thickness of 4in (0.33ft) or 6in (0.5ft).

For illustrative purposes we will use a slab 10ft X 6ft X 4in (0.33ft).

The volume for this slab is 20 cu ft.

An 80 lb bag of QUIKRETE concrete mix has a yield (volume) of .60 cu ft. A 60 lb bag of concrete mix will yield approximately .45 cu ft.

So, to calculate the total number of bags needed to pour a slab, divide the volume of the slab by the volume of the bag of concrete mix.

For this example the 10ft X 6ft X 4in slab will require 33 bags of 80 lb concrete mix ($20 / .60 = 33$) or 44 bags of 60 lb concrete mix ($20 / .45 = 44$).

**OR [Download the QUIKRETE Mobile app](#), which has a concrete calculator.*

Placing Concrete in Hot Weather

It is important to make sure the sub-base is level and consistent. For example, if the slab thickness varied from 4in to 5in (average 4.5 in) the volume of the slab would be increased to 22.5 cubic feet and require 38 bags of 80 lb concrete mix.

QUIKRETE® has included at-a-glance quantity calculators on all products to make volume calculation easy, or you can download the QUIKRETE® mobile app.



EXAMPLE:

Concrete Mix Calculator						
SETTING POSTS (# of bags per hole)						
Depth Of Hole In Inches (M)	18 (.46)	24 (.61)	30 (.76)	36 (.91)	42 (1.07)	48 (1.22)
Post 3" (75 mm) / Hole Dia. 9" (230 mm)	1	2	2	2	3	3
Post 4" (100 mm) / Hole Dia. 12" (300 mm)	2	3	3	4	4	5
SLABS						
Square Feet (M ²)	2 (0.2)	5 (0.5)	10 (0.9)	25 (2.3)	50 (4.7)	100 (9.3)
4" (100 mm) Thick - # of 80 lb (36.3 kg) bags	1	3	6	14	28	56
6" (150 mm) Thick - # of 80 lb (36.3 kg) bags	2	5	9	21	42	84
<i>All yields are approximate and do not allow for waste or uneven sub-grade, etc.</i>						

Placing & Finishing Concrete



Proper placing and finishing techniques are essential to achieving a successful concrete project. Before placing concrete in the form, a properly compacted 4" gravel base should be dampened.

Placing Concrete in Hot Weather

Pour the concrete mix in evenly placed loads. The top of the poured concrete mound should be 2"-3" above the forms before leveling.

Consolidate and distribute the concrete evenly using a hoe. The surface of the concrete should be relatively flat and slightly above the form.



Placing Concrete in Hot Weather

Use a straight 2x4 long enough to rest on the opposite side of the form to screed the concrete. Move the board in a sawing motion across the surface of the concrete to remove excess concrete and smooth the surface. Add concrete to any low areas and screed level.



Once the concrete has lost its sheen (the bleed water has evaporated) use a wood float in an arching motion to smooth the concrete surface.



Finishing Concrete

Immediately after floating the surface use a stiff-bristle broom to create a non-slip finish. All broom strokes should be made in the same direction.

For a smooth surface a finishing trowel can be used once the concrete becomes “thumbprint” hard. The finish can be applied using firm pressure with the trowel blade at a 30 degree angle. Be careful not to overwork the surface. Excessive troweling can cause hairline cracks to appear.



Finishing Concrete



Use a groover and straight-edge to cut in control joints. Control joints are designed to allow for expansion, contraction and movement of the concrete slabs. 4" thick slabs require control joints a minimum of every 10 lineal feet. The control joint must be cut a minimum of 1/4 the depth of the slab.



Finish and shape the concrete by making several passes with an edging tool.

How to Help Concrete Cure

Freshly placed concrete should be water-cured for a minimum of 3-5 days by keeping the surface damp with a fine water mist. The need for water curing can be eliminated by applying QUIKRETE® Acrylic Concrete Cure & Seal immediately after finishing the concrete. Acrylic Concrete Cure & Seal can be applied with a roller, garden sprayer or brush.



Placing Concrete in Hot Weather

Hot weather conditions can cause rapid evaporation of moisture from the surface of the concrete and accelerated setting time. Low humidity and wind velocity can also increase the potential for significant shrinkage cracking.

High temperatures cause:

- **Increased water demand**, thus increasing the water to cement ratio. This will result in a lower potential strength.
- **Accelerated slump loss** making the concrete difficult to place and finish.
- **Decrease in set time**, resulting in more rapid finishing.
- Concrete cured in at high temperatures at an early age will not be as strong at 28 days as the same concrete cured at an ambient temperature of 70°F.

Placing Concrete in Warm Weather

High Temperature

High Wind Velocity

Low Relative Humidity

These conditions will result in a high rate of evaporation and may result in early shrinkage cracking (drying shrinkage cracking), and the evaporation rate can remove the surface water that is necessary for hydration, resulting in a less durable surface....unless proper Hot Weather Concrete Practices are used.

Warm Weather Precautions

Planning ahead and utilizing the following steps will minimize the effects of hot weather conditions:

- Thoroughly dampen the sub-base gravel and wooden forms before placing the concrete.
- Don't try to mix and place more concrete than you can reasonably expect to finish and cover.
- Use cool (or cold) mixing water to slow the rate of hydration.
- Shade the concrete from direct sun and block the wind.
- Start curing as soon as possible after finishing.



Placing Concrete in Cold Weather

There are two main concerns when placing concrete in cold weather (Air temperature at 40°F or expected to drop below 40°F):

- Concrete can freeze before it gains strength. Freezing will damage the crystals that form in the cement “matrix”.
- Concrete sets much more slowly when it is cold—very slowly when concrete temperatures are below 50°F. In fact, the hydration process stops when concrete temperatures fall below 40°F and the concrete stops gaining strength. Set time and strength gain change by a factor of 2 for every 20° F.

Cold Weather Precautions

Proper preparation and following these steps will help ensure a successful concrete project.

- **Never place concrete on frozen ground** or onto ice or snow. Frozen ground will settle when it thaws and will create a void under your slab and potentially crack the concrete. Also, when the ground is cold, the concrete in contact with it will lose heat and will set more slowly.
- **Remove any snow, ice and standing water** in areas where concrete is to be placed.
- **Use warm (or Hot) mixing water** to increase the rate of hydration.
- **Do not finish concrete until the sheen is gone** from the surface. Because the concrete is setting at a slower rate it will take longer for the bleed water to appear and it will last longer on the surface.
- **Use insulated blankets to protect the concrete** as it cures. Concrete temperatures must be kept above 50 ° F for at least 3 days. Insulating blankets will hold the heat created by the hydration process as concrete hardens.

Mixing Concrete & Cement Quiz

1. Adding too much water to concrete mix can have which of the following results?
 - a) Shrinkage Cracking
 - b) Lower Strength
 - c) Reduced surface durability
 - d) All of the above

2. What is the technical term used to describe the fluidity of wet concrete?
 - a) Slump
 - b) Osmosis
 - c) Slick
 - d) Shear

3. When mixing concrete in a mechanical mixer, it is recommended that the dry concrete be added to the mixer first and then the water.
True
False

Mixing Concrete & Cement Quiz

4. Concrete should be mechanically mixed for what length of time?
 - a) 1-2 minutes
 - b) 3-5 minutes
 - c) 10-15 minutes
 - d) More than 15 minutes

5. It is recommended to blend liquid cement colors with the mixing water prior to adding to the concrete or mortar mix.
True
False

6. Calculate the volume, in cubic feet, of a slab that is 10 feet long, 6 feet wide and 4" deep.
 - a) 240 cubic feet
 - b) 20 cubic feet
 - c) 30 cubic feet
 - d) 8 cubic feet

7. The compacted base should be as dry as possible prior to pouring concrete.
True
False

Mixing Concrete & Cement Quiz

8. What is the recommended depth of a compactable base under a concrete sidewalk?
- a) 6"
 - b) 2"
 - c) 4"
 - d) 1"
9. For a 4" thick slab, Control joints, designed to allow for expansion, contraction and slab movement should be placed every.....?
- a) 4 feet
 - b) 10 feet
 - c) 20 feet
 - d) They are not necessary
10. Control joints in a 4" slab should be cut in with a groover a minimum of _____ deep.
- a) ¼"
 - b) ½"
 - c) 1"
 - d) 4"

Mixing Concrete & Cement Quiz

11. Concrete should be water cured for a minimum of 3-5 days with a fine water mist. The need for water curing can be eliminated by?
 - a) Adding calcium chloride to the mix
 - b) Adding fibers to the mix
 - c) Applying Acrylic Concrete Cure & Seal
 - d) Blocking the concrete from the sun and wind

12. Which of the following is a precaution to use in Hot Weather?
 - a) Use cool water
 - b) Thoroughly dampen the sub-base
 - c) Start curing as soon as possible
 - d) All of the above

13. The hydration (strength gain) process in concrete stops below what temperature?
 - a) 60 degrees
 - b) 50 degrees
 - c) 40 degrees
 - d) Never

Mixing Concrete & Cement Quiz - ANSWERS

1. d) All of the above
2. a) Slump
3. False
4. b) 3-5 minutes
5. True
6. b) 20 cubic feet
7. False
8. c) 4"
9. b) 10 feet
10. c) 1"
11. c) Applying Acrylic Concrete Cure & Seal
12. d) All of the above
13. c) 40 degrees